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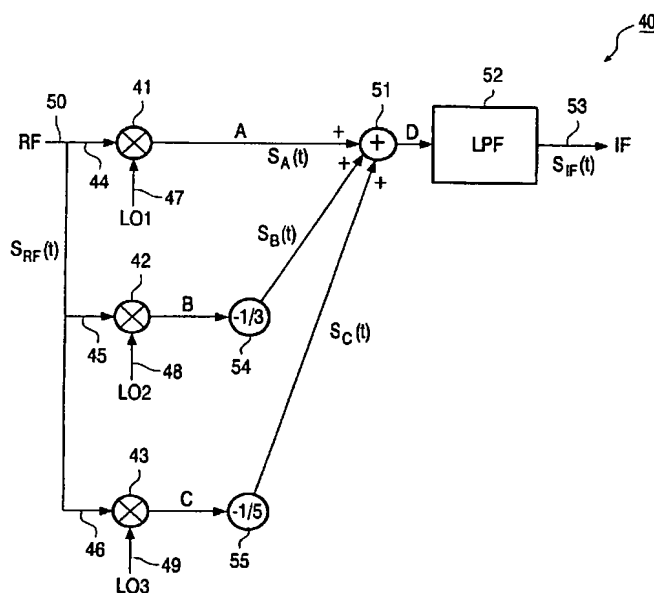
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(54) Title: IMPROVED MIXERS WITH A PLURALITY OF LOCAL OSCILLATORS AND SYSTEMS BASED THEREON



(57) Abstract: Apparatus (40) for processing an input signal ($S_{RF}(t)$) with a carrier frequency (ω_{RF}) defining a desired band and at least a sideband being defined by a sideband frequency ($n\omega_{LO}$) that is higher than the carrier frequency (ω_{RF}). The apparatus (40) comprises a main input (50) for receiving said input signal ($S_{RF}(t)$) and a first standard mixer (41) having a first mixer input (44), a first local oscillator input (47), and a first mixer output (A). The first mixer input (44) is connected to the main input (50) and the first local oscillator input (47) is connected to a source that provides a first local oscillator signal (LO1) having a frequency (ω_{LO}). This frequency (ω_{LO}) is close to or equal to the carrier frequency (ω_{RF}). The first standard mixer (41) performs a multiplication of the input signal ($S_{RF}(t)$) and the first local oscillator signal (LO1) to provide a first output signal ($S_A(t)$) at the first mixer output (A). The apparatus (40) further comprises a second mixer (42) with a second mixer input (45), a second local oscillator input (48), and a second mixer output (B). The second mixer input (45) is connected to the main input (50) and the second local oscillator input (48) is connected to a source that provides a second local oscillator signal (LO2) with the sideband frequency ($n\omega_{LO}$). The second mixer (42) performs a multiplication of the input signal ($S_{RF}(t)$) and the second local oscillator signal (LO2) to provide a second output signal ($S_B(t)$) at the second mixer output (B). There are means for superpositioning (51) the first output signal ($S_A(t)$) and the second output signal ($S_B(t)$). The first local oscillator signal (LO1) and the second local oscillator signal (LO2) are square-wave signals. The apparatus (40) may comprise a third source that provides a third local oscillator signal (LO3). This third local oscillator signal (LO3) can be fed a mixer (43) where a multiplication is performed. If such a third source is used, the means for superpositioning (51) perform a superpositioning of three signals ($S_A(t)$), ($S_B(t)$), and ($S_C(t)$).



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 322 024 A (PHILIPS LTD.) 28 June 1989 (1989-06-28) column 3, line 53 - column 4, line 40; figures 1-3	1,12
A	----- GB 2 369 507 A (RAYTHEON CO.) 29 May 2002 (2002-05-29) page 7, line 28 - page 8, line 14 page 10, line 6 - page 11, line 13; figures 1,3	1,12
A	----- US 5 390 248 A (M. SEGAN) 14 February 1995 (1995-02-14) column 5, line 1 - column 6, line 20; figure 3 ----- -/--	1,12



Further documents are listed in the continuation of box C.



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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 137 497 A (O. LOWENSCHUSS) 30 January 1979 (1979-01-30) column 2, line 60 - column 4, line 53; figure 1 -----	1,12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IB 03/03138

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0322024	A	28-06-1989	GB 2214014 A	23-08-1989
			EP 0322024 A2	28-06-1989
			US 4914380 A	03-04-1990
GB 2369507	A	29-05-2002	US 6452982 B1	17-09-2002
			AU 7472400 A	10-04-2001
			WO 0118954 A1	15-03-2001
US 5390248	A	14-02-1995	GB 2274341 A	20-07-1994
US 4137497	A	30-01-1979	AU 519665 B2	17-12-1981
			AU 4092778 A	24-04-1980
			CA 1114902 A1	22-12-1981
			DE 2845153 A1	03-05-1979
			FR 2407481 A1	25-05-1979
			GB 2007051 A , B	10-05-1979
			IT 1107971 B	02-12-1985
			JP 1142335 C	13-04-1983
			JP 54074478 A	14-06-1979
			JP 57033550 B	17-07-1982